REMARKS

In response to the Official Action mailed on August 4, 2008, the application has been amended. No new matter has been added. Reconsideration of the rejections of the claims is respectfully requested in view of the above amendments and the following remarks.

In paragraph 2 of the Official Action, the abstract was objected to because it was more than one paragraph. The abstract has been amended to correct this informality as well as to improve its readability.

In paragraph 3 of the Official Action, the disclosure was objected to because the Examiner felt that the use of the term "charge" in the specification was unclear. In particular, the Examiner felt that page 3, lines 26 - 29 were unclear.

The term "charge" is commonly used as a verb in the metallurgical fields to refer to the process of introducing a material into a vessel, a hopper, a melt, a solution, etc. Webster's New World Dictionary, College Edition (World Publishing Company, 1968) gives "to put a load on or in; load or fill to usual capacity" as the first definition of "charge". Although it could be replaced by a verb such as "put", "place", or "introduce", many in the metallurgical fields seem to prefer (perhaps for historical reasons) to use the word "charge". As

such, it is believed that a person skilled in the art would have no difficulty in understanding the meaning of the term as it is used in the present specification.

As for the sentence on page 3, lines 26 - 29 pointed out by the Examiner, this sentence has been amended to change "a high concentration of P was charged" to "a high concentration of P was charged into the solder bath" to clarify exactly what charging operation is being described, thereby overcoming the objection.

In paragraph 5, claims 9 - 10, 14 - 16, and 20 were rejected under 35 USC 102(b) as anticipated by the description on pages 1 - 4 of the specification of previously conceived methods of replenishing a solder bath. This rejection is respectfully traversed.

The Official Action refers to the description on pages 1 - 4 as being the applicant's admitted prior art (AAPA). Since it is not clear that every method described on pages 1 - 4 is in fact prior art (the specification does not use the term "prior art", and except for the Japanese patent documents identified in the middle of page 3, the specification does not state that anything described on pages 1 - 4 is prior art under U.S. patent law), the description on pages 1 - 4 of the specification will simply be referred to here as "the description on pages 1 - 4 of the specification" without any acknowledgement concerning whether anything on these pages is prior art.

Claim 9 as filed did not accurately describe the invention

which the Applicants intended to claim. What claim 9 should have stated was that the replenishment solder alloy has a higher concentration of the oxidation suppressing element than does the initial composition of the solder bath. Accordingly, claim 9 has been amended to clarify the relationship between the concentration of the oxidation suppressing element in the replenishment solder alloy and the concentration of the oxidation suppressing element in the solder bath. Amended claim 9 is supported by page 5, lines 25 - 27 and by page 8, lines 17 - 25 of the application as filed. (Claims 10 and 11 have likewise been amended to refer to the initial composition of the solder bath so as to agree with the wording of amended claim 9). The description on pages 1 - 4 of the specification does not disclose the method described by amended claim 9.

First, it is necessary to clarify what is meant by "replenishment solder alloy". This refers to a solder alloy which is added to a solder bath in order to maintain the level of the bath essentially constant. In a solder bath and especially in a wave soldering bath, it is important to maintain the bath at a nearly constant level, since fluctuations in the height of the bath surface can result in fluctuations in the amount of molten solder applied to parts being soldered. Solder replenishment for the purpose of maintaining the level of a bath must take place at frequent intervals. A replenishment solder is to be distinguished from a solder which is added to a solder bath at infrequent intervals in order to adjust the content of an

oxidation suppressing element, such as P. As stated on page 3, lines 17 - 20, in the prior art, there was a clear distinction between a replenishment solder alloy used to adjust the height of a solder bath and a solder alloy used not to adjust the bath height but to adjust the content of an oxidation suppressing element.

The description on pages 1 - 4 of the specification does not contain any description of replenishing a solder bath with a replenishment solder alloy having a higher concentration of an oxidation suppressing element than the initial concentration of the bath, as set forth in claim 9.

Page 3, lines 6 - 12 of the specification refer to Japanese Published Unexamined Patent Application Sho 54-84817, which discloses a deoxidizing alloy having a much higher content of P than is present in a solder bath. The deoxidizing alloy is added to the solder bath in small quantities solely to adjust the P concentration and is totally separate from a replenishment solder alloy used to maintain the level of the bath.

Page 3, lines 13 - 16 of the specification describes two known alloys containing P, but neither of these alloys is related to replenishment of a solder bath.

Page 3, lines 21 - 28 of the specification describes soldering using a P-free solder alloy in which a small amount of a solder alloy having a high concentration of P was charged into a solder bath as the P in the solder in the solder bath decreased, and a solder alloy not containing any P was supplied

as the level of solder in the solder bath decreased. Thus, the replenishment solder alloy was a solder alloy not containing any P, and the P-containing solder was not a replenishment solder alloy but an alloy for adjusting the P content of the bath.

Page 4, lines 1 - 7 of the specification describe a situation in which a solder bath is replenished with a solder alloy which is the same as the initial solder used to form the bath. As such, the replenishment solder alloy has the same concentration of an oxidation suppressing element as the initial concentration of the bath.

Page 4, lines 11 - 17 describe a method in which a mother alloy which is adjusted to have a high concentration of an oxidation suppressing element is supplied to a solder bath periodically, such as every day or 2 - 4 times per month. This mother alloy is an alloy for adjusting the concentration of the oxidation suppressing element and not a replenishment solder alloy, since a solder bath needs to be replenished constantly to maintain the bath height and cannot possibly be replenished only "every day or 2 - 4 times per month".

Accordingly, it can be seen that none of the methods described on pages 1 - 4 of the specification is a method including replenishing a solder bath with a replenishment solder alloy having a higher concentration of an oxidation suppressing element than does the initial composition of the solder bath, as set forth in amended claim 9. Thus, those methods do not include all the steps set forth in claim 9 and so cannot anticipate it or

claims 10, 14 - 16, and 20 which depend from claim 9. These claims are therefore allowable.

In paragraph 12 of the Official Action, claim 11 was rejected under 35 USC 103(a) as unpatentable over the description on pages 1 - 4 of the specification in view of Nishimura et al (WO 01/62433 A1, referred to below as Nishimura). This rejection is respectfully traversed.

Claim 11 depends from amended claim 9, which includes replenishing a solder bath with a replenishment solder alloy having a higher concentration of an oxidation suppressing element than does the initial composition of the solder bath. As set forth above, the description on pages 1 - 4 of the specification does not disclose such a method. Nishimura was relied upon as teaching a method in which a replenishment solder alloy contains a lower concentration of Cu than is present in the solder bath in order to prevent the concentration of Cu from rising excessively. Nishimura contains no disclosure or suggestion of replenishing a solder bath with a replenishment solder alloy having a higher concentration of an oxidation suppressing element than does the initial composition of the solder bath. On the contrary, Nishimura teaches that it is unnecessary to adjust the concentration of elements such as phosphorus in a solder bath. Page 8, line 16 of Nishimura states that "Positively controlled element was only copper, and there is no need for controlling other elements. This is true of the alloys which contain silver

bismuth, indium phosphorus, germanium, etc. for improving wettability or for anti-oxidation."

Therefore, as neither the description on pages 1 - 4 of the specification as filed or Nishimura contains any teaching or suggestion of replenishing a solder bath with a replenishment solder alloy having a higher concentration of an oxidation suppressing element than does the initial composition of the solder bath, they cannot be combined in a manner so as to result in a method having all the features set forth in claim 9 and included in claim 11 by its dependence from claim 9. Claim 11 is therefore allowable.

In paragraph 15 of the Official Action, claim 12 and 13 were rejected under 35 USC 103(a) as unpatentable over the description on pages 1 - 4 of the specification. This rejection is respectfully traversed.

Claim 12 has been amended so as to match the wording of claim 9 and to specify that the concentration of the oxidation suppressing element in the replenishment solder alloy is 2 to 6 times the concentration of the oxidation suppressing element in the initial composition of the solder bath. Amended claim 12 is supported by page 8, line 15 which states that the target concentration, previously referred to in claim 12, is the initial concentration of P in a bath. The description on pages 1 - 4 of the specification does not disclose or suggest such a method. Paragraph 17 of the Official Action refers to page 4 of the

specification which describes a method in which a mother alloy is added to a solder bath periodically, such as every day or 2 - 4 times per month. As stated above with respect to claim 9, the mother alloy described on page 4 of the specification is not a replenishment solder alloy but is an alloy added to a solder bath solely to adjust the concentration of an oxidation suppressing element. Page 4 of the specification contains no disclosure of any method which involves adding a replenishment solder alloy which has a higher concentration of an oxidation suppressing element than does the initial composition of the solder bath, so it cannot possibly suggest a replenishment solder alloy having a concentration of an oxidation suppressing element which is 2 to 6 times the initial concentration of the oxidation suppressing element in the bath. Claim 12 is therefore allowable. Claim 13 has been cancelled as unnecessary, so its rejection is now moot.

In paragraph 19 of the Official Action, claims 17 - 19 were rejected under 35 USC 103(a) as unpatentable over the description on pages 1 - 4 of the specification in view of Steen et al (WO 01/03878 A1, referred to below as Steen) and Kim (KR 2001107354 A). This rejection is respectfully traversed.

Steen and Kim were both relied upon as teaching solder alloys containing P in a concentration overlapping the range of 60 - 100 ppm set forth in claims 17 and 19. According to paragraph 23 of the Official Action, it would have been obvious to have used the composition of either Steen or Kim in a solder

composition in a wave soldering method.

The error in this argument is that merely using the solder alloys of Steen or Kim would not result in a method having all the steps set forth in claims 17 - 19. These claims depend from claim 9, which includes replenishing a solder bath with a replenishment solder alloy having a higher concentration of an oxidation suppressing element than the initial composition of the solder bath. As set forth above with respect to claim 9, the description on pages 1 - 4 of the specification contains no disclosure or suggestion of a replenishment solder alloy which has a higher concentration of an oxidation suppressing element than the initial composition of a solder bath. Steen and Kim merely disclose solder alloys and do not teach anything about replenishment of a solder bath. Therefore, as neither the description on pages 1 - 4 of the specification nor the cited references disclose replenishing a solder bath with a replenishment solder alloy having a higher concentration of an oxidation suppressing element than the initial composition of the solder bath, they cannot be combined so as to result in a method having all the features recited in claim 9 and included in claims 17 - 19 by their dependence on claim 9 and so cannot render these claims obvious. Claims 17 - 19 are thus allowable.

Claims 21 - 23, which were withdrawn from consideration, have been cancelled, and new claims 24 - 29 have been added to describe additional features of the present invention. New claim

24 describes a soldering method including first performing soldering while replenishing a solder bath with a replenishment solder alloy having the same composition as the initial composition of the solder bath and then switching to a second replenishment solder alloy which has a higher concentration of the oxidation suppressing element. As set forth above with respect to claim 9, neither the description on pages 1 - 4 of the specification nor any of the cited references discloses or suggests a replenishment solder alloy having a higher concentration of an oxidation suppressing element than the initial composition of a solder bath. Claim 24 and claims 25 - 29 which depend from it are therefore allowable.

In light of the foregoing remarks, it is believed that the present application is in condition for allowance. Favorable consideration is respectfully requested.

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